THURSDAY, JULY 17, 1913.

ARISTARCHUS OF SAMOS.

Aristarchus of Samos: The Ancient Copernicus. A History of Greek Astronomy to Aristarchus together with Aristarchus's Treatise on the Sizes and Distances of the Sun and Moon. A New Greek Text with Translation and Notes. By Sir Thomas Heath, K.C.B., F.R.S. Pp. viii+425. (Oxford: Clarendon Press, 1913.) Price 18*s*. net.

ARISTARCHUS, who flourished in the first half of the third century B.C., is chiefly known as the only philosopher or astronomer of antiquity who taught that the earth moves round the sun. This doctrine is, however, not mentioned in the only writing of his which has been preserved, and the little we know about it is derived from allusions to it made by subsequent writers. All the same, his little book, "On the Sizes and Distances of the Sun and Moon," is of great importance, and Sir Thomas Heath's new and critical edition, accompanied by a translation, commentary, and notes, is therefore a most welcome addition to the literature of astronomical history.

Considering that the idea of the earth being in the centre of the universe reigned undisturbed until less than four hundred years ago, it is one of the most surprising facts in the history of astronomy that its motion round the sun should have been proposed more than 1700 years before the time of Copernicus, and that it should only have been accepted by one single philosopher, Seleukus, as to whom it is not even certain that he went the whole way and did not merely accept the daily rotation of the earth. The editor of this new edition of Aristarchus, therefore, thought it desirable to prepare a lengthy introduction to the work, giving an account of the progress of astronomy in Greece from the time of Thales to and including that of Aristarchus. Though this is not the first time that an English writer has dealt with this subject, Sir Thomas Heath has done good work by preparing this introductory memoir, which fills more than three hundred pages, as he possesses special qualifications for writing the history of Greek science, and there are various controversial matters which cannot be too much discussed—provided it is done by writers who are as competent to do so as he is. The author gives full references to the very copious literature on the subject; indeed, he even notices some statements which he might well have ignored, such as the comically exaggerated picture drawn by Gomperz, of how Demokritus seems to have anticipated out of his inner consciousness many modern discoveries. The passages in the works of ancient writers from which our knowledge of early Greek astronomy is derived are always given at full length in translation, which many readers who may not have access to the originals will find very convenient.

The chapters on the pre-Socratic philosophers, the Pythagoreans, Plato, Eudoxus, and Aristotle, do not call for special notice. They deal very fully and fairly with all the questions about which a good deal of controversy raged fifty or sixty years ago, but which may now be considered finally settled. Nobody now believes that Plato taught the daily rotation of the earth, or that he, in his old age, was inclined to think that the sun was at the centre of the universe. The debatable question is now, how astronomy can have advanced so much during the sixty or seventy years after the promulgation of the system of concentric spheres of Eudoxus as to lead Aristarchus to announce that the earth moved round the sun in a year.

The dominating figure of this period (as regards the progress of astronomy) is not Aristotle, but Herakleides of Pontus. Of him we know with certainty that he taught the rotation of the earth and the motion of Mercury and Venus round the sun. But much greater honours were claimed for him by Schiaparelli, who, in a memoir published in 1898, tried to show that Herakleides not only must have extended his theory from the inferior to the superior planets, thus enunciating the Tychonic system, but that he must also have taken the next step in favour of the heliocentric system. He should thus have anticipated Aristarchus. The only alleged proof of this is a passage in a lost book by Geminus (who lived 250 years after Herakleides) quoted by Simplicius. That this very peculiarly worded passage is corrupt is beyond a doubt; Sir Thomas Heath shows clearly that the name of Herakleides occurring in it is a later interpolation, and he suggests that Geminus may simply have been alluding to the doctrine of Aristarchus. But in any case it is impossible to get over the express statement of Simplicius that Herakleides assumed the earth to be in the middle, while Aëtius (the compiler of the "Placita Philosophorum") distinctly says that Herakleides let the earth move, "not progressively, but in a turning manner." That is to say, it stood still, but it rotated on its axis.

There is therefore no reason to believe that Aristarchus had any predecessor in developing first the so-called system of movable excentrics, and then, by a bold step, the heliocentric system. That

©1913 Nature Publishing Group

this met with no acceptance was doubtless due to the improved knowledge of the motions of the planets in the third century, when it was found that there were other irregularities which could not be accounted for by assuming the earth to be in motion.

The book of Aristarchus, now for the first time translated into English, is of great interest to the mathematician because the ratios of the sizes and distances which he calculates are really trigonometrical ratios, sines, cosines, &c., although at the time when the book was written trigonometry had not been invented, and no close approximation to the value of π was known. Aristarchus therefore endeavours to find upper and lower limits for those ratios by assuming propositions comparing the ratio between a greater and a smaller angle in a figure with the ratio between two straight lines in the figure. These propositions were afterwards proved by Ptolemy. To the astronomer the book is particularly interesting by the attempt made by Aristarchus to determine the ratio of the distances of sun and moon by observing their angular distance at the time when the moon was half illuminated. The very erroneous result found (19 : 1), corresponding to a solar parallax of 3′, continued to be accepted from the time of Ptolemy to that of Kepler.

J. L. E. D.

THE APOTHEOSIS OF THE POTATO.

(1) *The Potato: A Compilation of Information from Every Available Source.* By E. H. Grubb and W. S. Guilford. Pp. vii + 545. (London: Constable and Co., Ltd., 1913.) Price 8*s.* 6*d.* net.

(2) *Commercial Gardening: A Practical and Scientific Treatise for Market Gardeners, Market Growers, Fruit, Flower and Vegetable Growers, Nurserymen, &c.* By many practical Specialists, under the Editorship of John Weathers. In four volumes. Vol. i., pp. xiii + 239 + plates; vol. ii., pp. xii + 235 + plates; vol. iii., pp. xii + 240 + plates; vol. iv., pp. xii + 244 + plates. (London: The Gresham Publishing Co., 1913.) Price 36*s.* net, the four volumes.

(1) THERE are men who, having attained to wealth and fame by the agency of some humble instrument, basely repudiate and kick over the ladder by which they have risen. Not so the authors of the first book on our list. The potato has "made" them, and in return they proceed to "make" the potato. A large number of men have at times written about this vegetable, and extracts from their books and papers occupy a very large proportion of the volume. The food value, methods of propagating, cultivating, harvesting, and selling, all receive attention, but the authors are so evidently enthusiastic, and discourse so eloquently on the merits of their subject, that we are carried along with them, and forget that, after all, they are only talking about potatoes, and not about alpine plants or roses.

The book makes one realise, as nothing else we know has quite done, how manifold are the aspects from which a simple natural object can be regarded. Successive chapters give long quotations from the writings of chemists, botanists, zoologists, entomologists, mycologists, agriculturists, engineers, economists, legislators, business men, doctors, historians, geographers, all dealing with problems directly and closely connected with the potato. And the senior author shows us enough of his personality to let us see how entirely enthusiastic the plant-fancier may become over this plant. There is nothing critical about the book, and the student of science may not find much of direct value to him. Perhaps its main interest to the general reader is that it deals with one of the humblest products of the garden in the same enthusiastic and affectionate spirit as Dean Hole wrote about roses, or Farrar about "alpines."

(2) The four volumes on commercial gardening represent a somewhat ambitious attempt to put into one work the rather wide knowledge that the successful grower ought to have of crops, manures, markets, &c.; they are frankly intended for the commercial man only. Had they been confined to practical matters we should have found little fault with them, but the scope has been widened, and chapters on "science" have been inserted. It might be argued that sound science could not fail to be useful to the grower; on the other hand, it might also be argued that the busy grower has no time to concern himself with the reasons for things, but simply wants specific, trustworthy information on his problems. Either plan might have been adopted and justified. But we do not see any justification for the third plan that has been followed of putting in poor science. While a first-hand knowledge seems to have been expected of the writers on practical subjects, no such qualification seems to have been deemed necessary in the case of science. We are not referring, of course, to Mr. Massie's and Mr. Theobald's contributions, or to some of the botanical work, which is also good, but the large sections on science are in the main distinctly poor. Some of the errors are ludicrous, and could have been corrected by any good student at an agricultural college. The distinction between

©1913 Nature Publishing Group